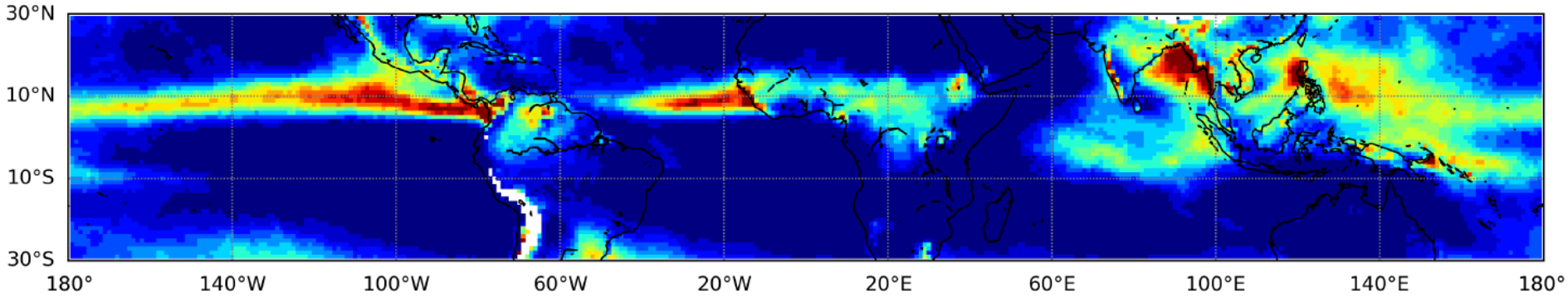
Status of the Megha-Tropiques mission

Precipitation related activities



TAPEER1.5 -BRAIN/ Jul-Sep seasonal average /2012-2016 mean

Rémy Roca, CNRS/LEGOS, Toulouse (roca@legos.obs-mip.fr)

and the french scientists from the Megha-Tropiques team

Outline of the presentation

- Outcome of the first exploitation phase (2011-15)
- News from the mission
- Scientific and operational activities
  - Assimilation
  - Hydrology
- On going developments: TAPEER 2.0-GPROF

Outcome of the nominal phase of the mission

Summary

frontiers in Earth Science | Atmospheric Science

SECTION ABOUT ARTICLES RESEARCH TOPICS FOR AUTHORS EDITORIAL BOARD ARTICLE ALERTS

‹ Articles

ORIGINAL RESEARCH ARTICLE

Front. Earth Sci., 18 May 2015 | https://doi.org/10.3389/feart.2015.00017

The Megha-Tropiques mission: a review after three years in orbit

Rémy Roca[1*], Hélène Brogniez[2], Philippe Chambon[3], Olivier Chomette[4], Sophie Cloché[5], Marielle E. Gosset[6], Jean-Francois Mahfouf[3], Patrick Raberanto[4] and Nicolas Viltard[2]

[1]Laboratoire d'Etudes en Géophysique et Océanographie Spatiales (UPS/IRD/CNES/CNRS), Toulouse, France
[2]Laboratoire Atmosphères, Milieux, Observations Spatiales (IPSL/UVSQ/UPMC/CNRS), France
[3]Centre National de la Recherche Météorologique/GAME, Météo France and CNRS, Toulouse, France
[4]Laboratoire de Météorologie Dynamique, Palaiseau, France
[5]Institut Pierre Simon Laplace, Palaiseau, France
[6]Géoscience Environnement Toulouse, Toulouse, France

Download Article | Export citation

4,400 TOTAL VIEWS

Am score 1

View Article Impact

frontiers SPOTLIGHT AWARD

- **Validation by the scientific team of the Project calibration and Authorization for data distribution at International (SCARAB et SAPHIR en 2013 et MADRAS en 2015)**

- **« Proof of concept » of the mission : orbit & payloads**
  - **Assimilation-wise**
  - **Precip estimation-wise**

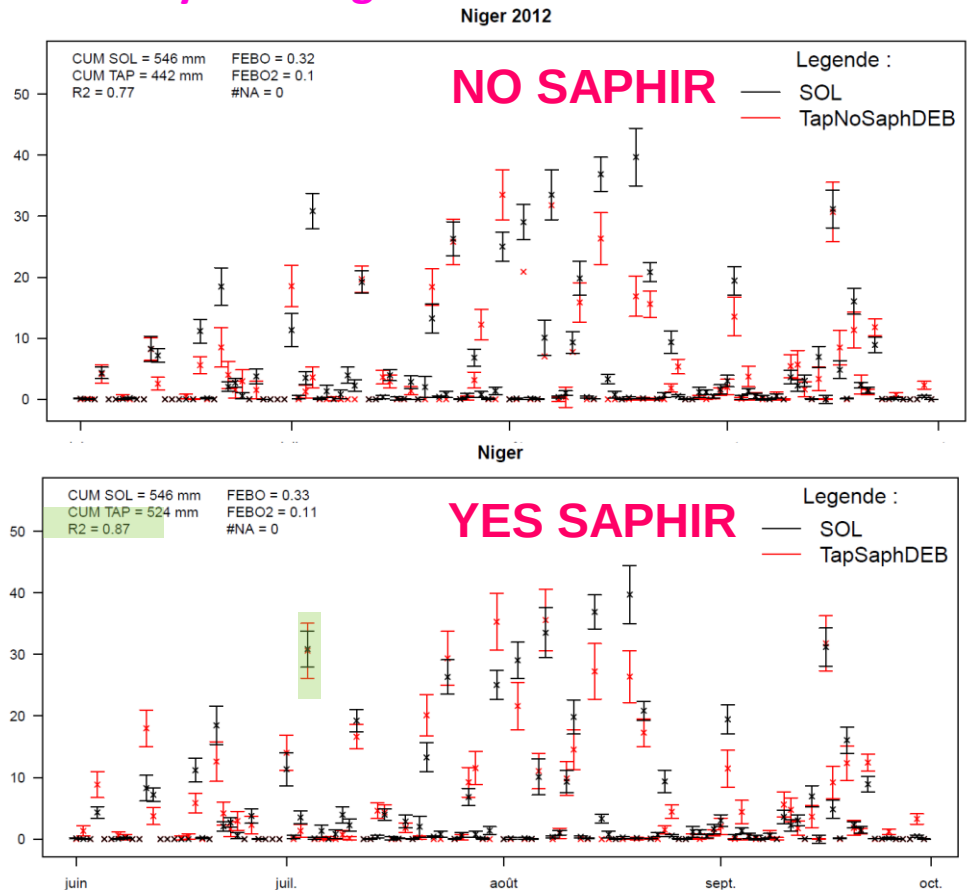
Roca R, H Brogniez, P Chambon, O Chomette, S Cloché, M Gosset, JF Mahfouf, P Raberanto and N Viltard, **2015** The Megha-Tropiques mission: a review after three years in orbit, Front. Earth Sci., 3, 1–14, doi:10.3389/feart.2015.00017, 2015.

Proof of concept

Precip-wise

Quantifying the contribution of SAPHIR

Case study over Niger

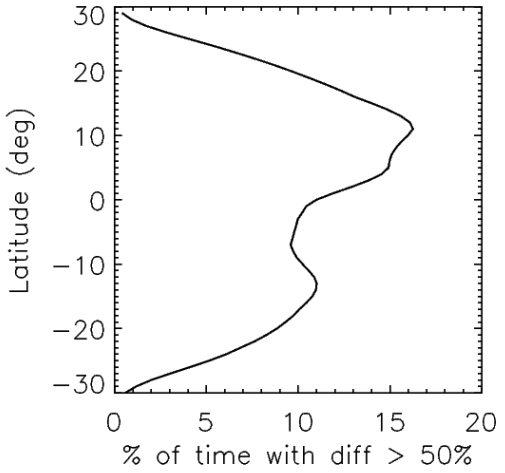


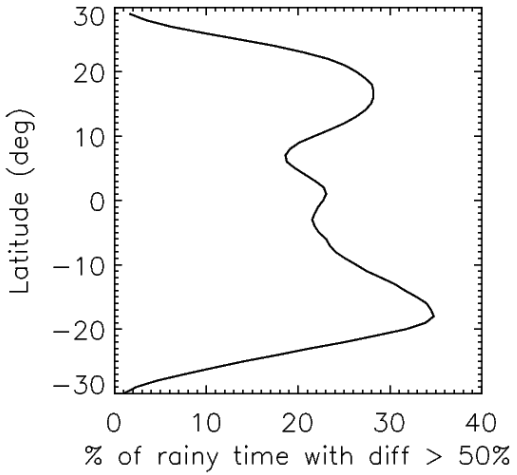
Courtesy M. Gosset

Summer 2012 global

(top) Zonal mean fraction of the time for which the NoS experiment differs from the baseline product by more than 50% of the daily accumulation.

(bottom) Zonal mean of the for which the NoS experiment differs from the baseline product by more than 50% of the daily accumulation number of days normalized by the total number of rainy days.





Roca et al., Quantifying the contribution of the Megha-Tropiques mission to the estimation of daily accumulated rainfall in the Tropics, in preparation for the Special Collection "Advances in Remote Sensing of Rainfall and Snowfall", Q. J. R. Meteorol. Soc., **2017**

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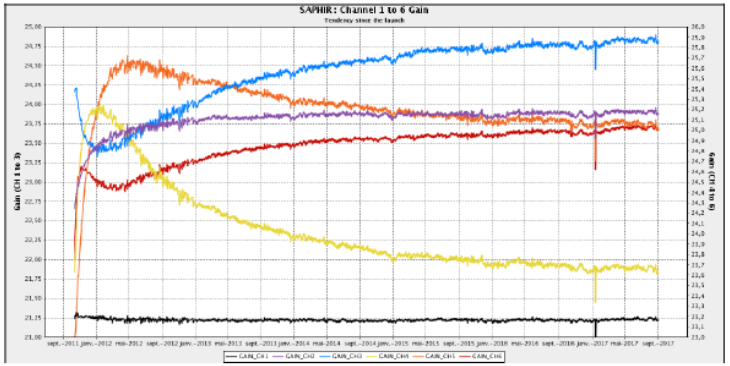
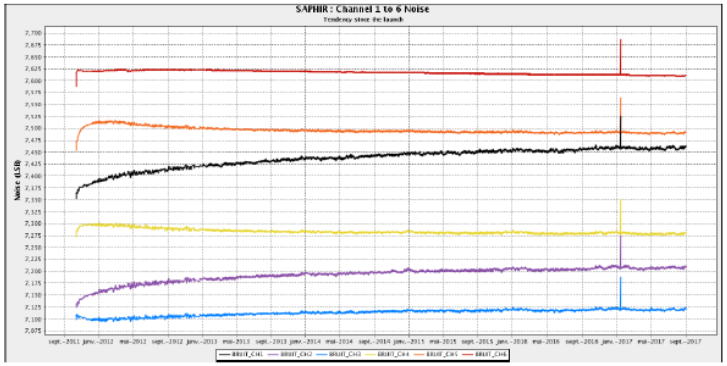
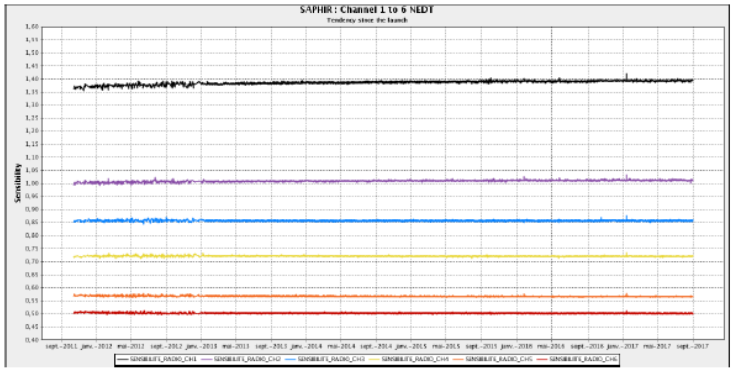
Saphir Instrument monitoring

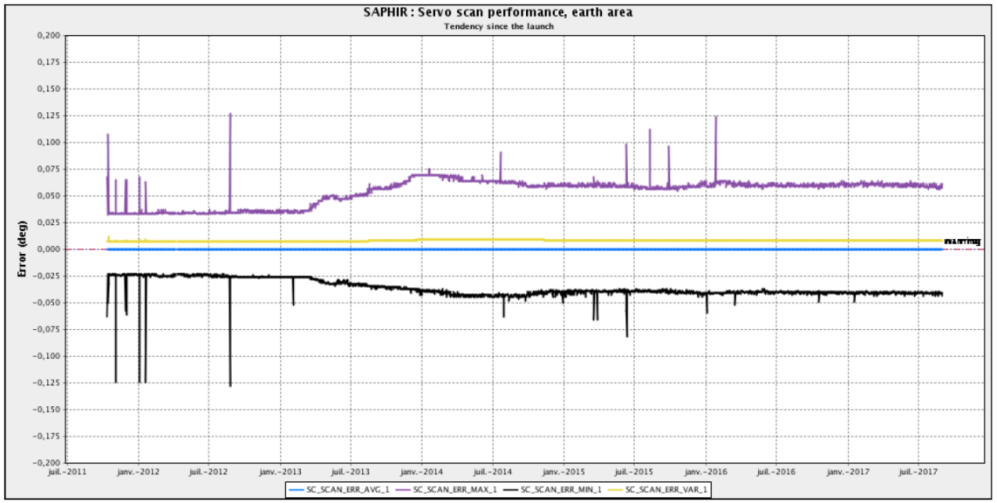
More than 6 years since last week !





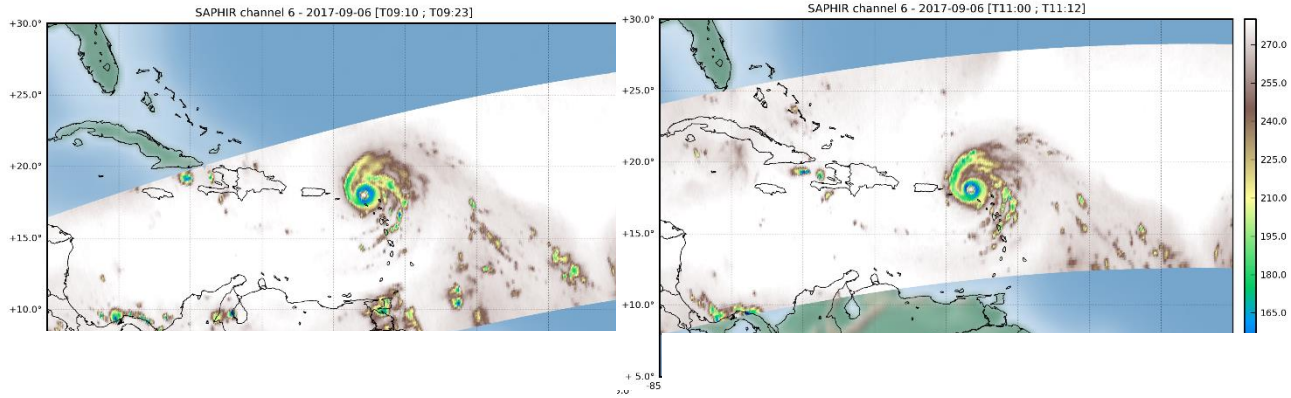


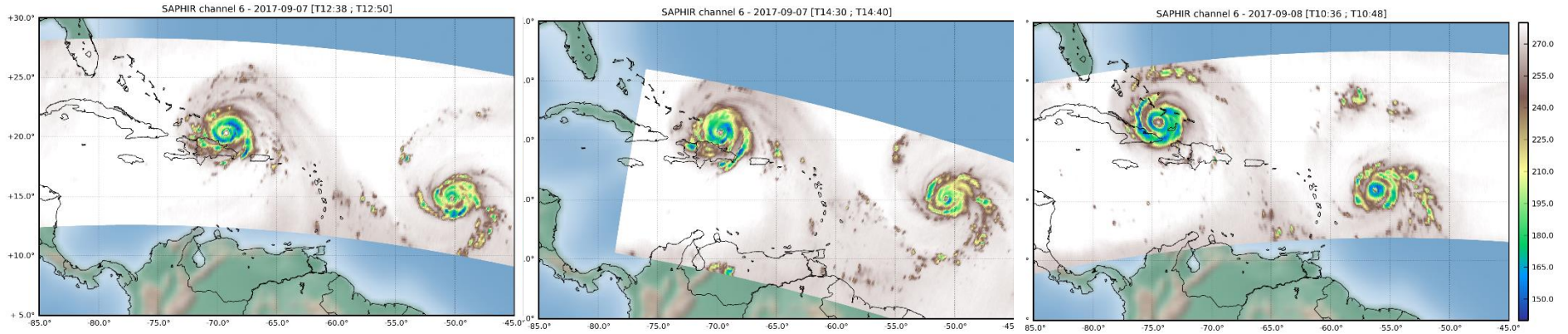
- SAPHIR fully operational after more than 2000 days (close to 6 years).
- Instrument in perfect heath, no drift, no attrition, the mechanism have reached more than 1,2E8 turn.
- About 180 parameters are daily controlled with no warning until now.
- The community of users is growing and there are welcome.



Courtesy M. DEJUS - CNES

Saphir monitors the hurricanes Irma and José





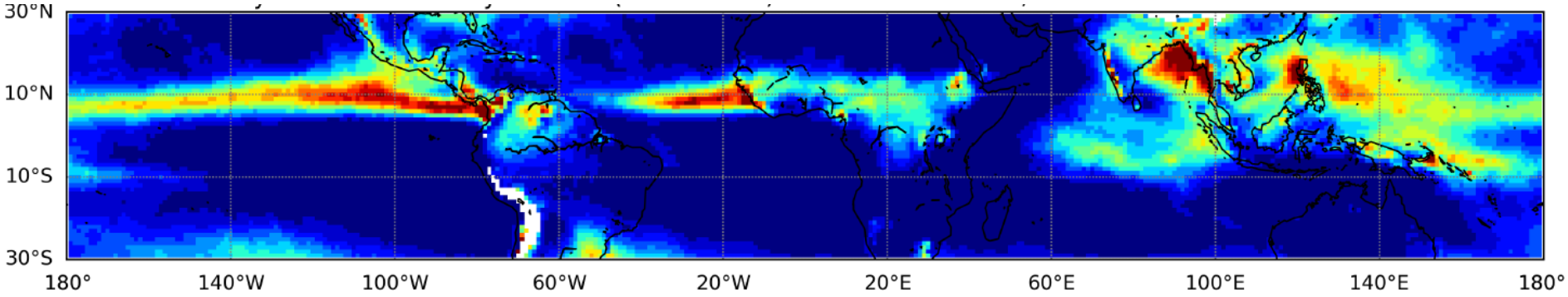
Courtesy P. Chambon

TAPEER1.5/BRAIN is released !

Since June 2017

1°X1° X 1day accumulated precipitation + estimates of the uncertainty
All GEO IR data

TMI, AMSR2, SSMI F15, SSMIS F16, F17, F18
SAPHIR detection only



TAPEER1.5-BRAIN- / Jul-Sep seasonal average /2012-2016 mean

Available at http://www.icare.univ-lille1.fr/mt

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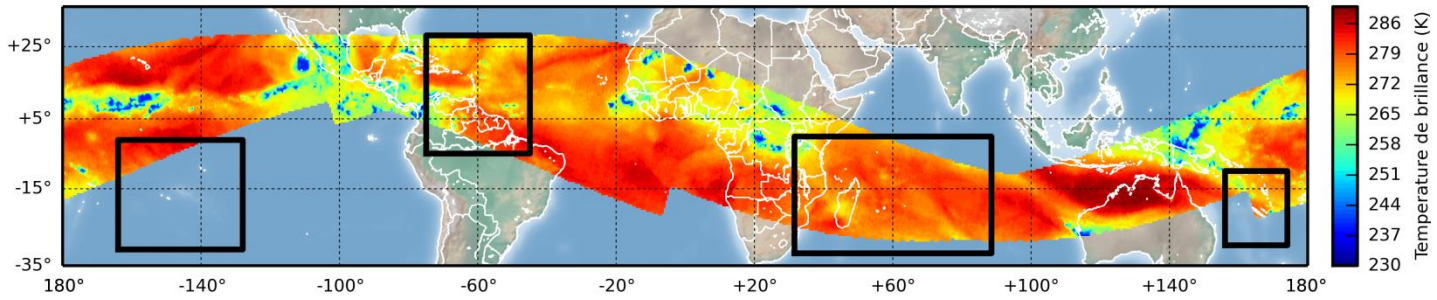
Real time stream of SAPHIR at NWP

NRT Stream via EUMETCast since Summer 2014



Courtesy P. Chambon

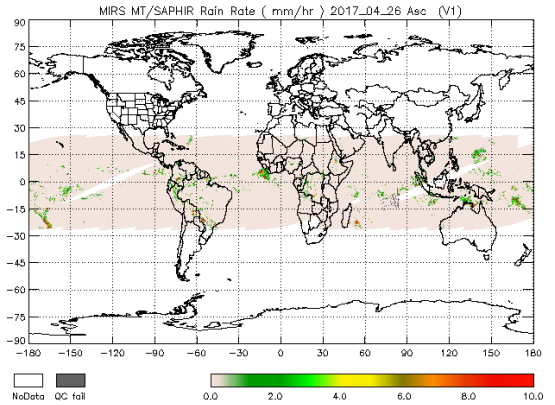
- **Operational Assimilation in CLEAR SKY**
  - **Météo-France** since 13 April 2015
    - Global model ARPEGE
    - Regional model ALADIN Réunion
  - **JMA** since 25 June 2015
    - Global Model
  - **NCMRWF** since March 2014
    - GFS model
  - **SAC Ahmedabad**
    - WRF based forecast system

- **In May 2017 see next slides**
  - **NOAA**
  - **UK MET Office**
  - **ECMWF total sky radiance joint effort with Météo-France by P Chambon**
  - **Météo-France for total sky radiance**
  - **KMA asked ISRO for NRT stream access (January 2017)**

Real time stream of SAPHIR at NWP

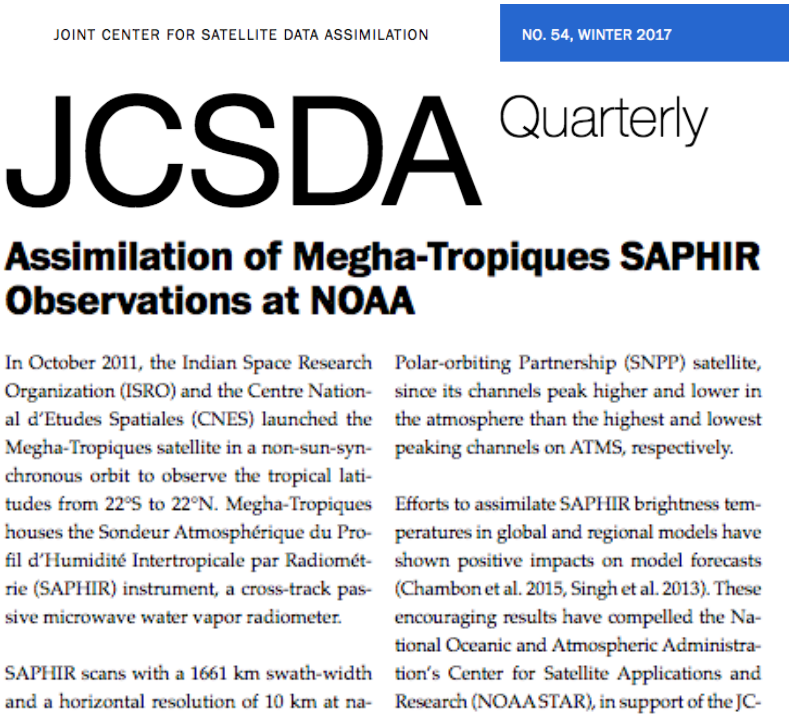
NRT Stream via EUMETCast since Summer 2014

- SAPHIR data are used operationnally at NOAA/NESDIS/OSPO in the framework of the MiRS project (retrievals of Total Precipitable Water et rainrate)
  http://www.ospo.noaa.gov/Products/atmosphere/mtrops/RRAnim.html



- SAPHIR Actually used in monitoring mode
- Assimilation in upcoming upgrade

- A publication is in the final stage of revision on the impact of the assimilating SAPHIR



JOINT CENTER FOR SATELLITE DATA ASSIMILATION NO. 54, WINTER 2017

JCSDA Quarterly

Assimilation of Megha-Tropiques SAPHIR Observations at NOAA

In October 2011, the Indian Space Research Organization (ISRO) and the Centre National d'Etudes Spatiales (CNES) launched the Megha-Tropiques satellite in a non-sun-synchronous orbit to observe the tropical latitudes from 22°S to 22°N. Megha-Tropiques houses the Sondeur Atmosphérique du Profil d'Humidité Intertropicale par Radiométrie (SAPHIR) instrument, a cross-track passive microwave water vapor radiometer.

SAPHIR scans with a 1661 km swath-width and a horizontal resolution of 10 km at nadir. Polar-orbiting Partnership (SNPP) satellite, since its channels peak higher and lower in the atmosphere than the highest and lowest peaking channels on ATMS, respectively.

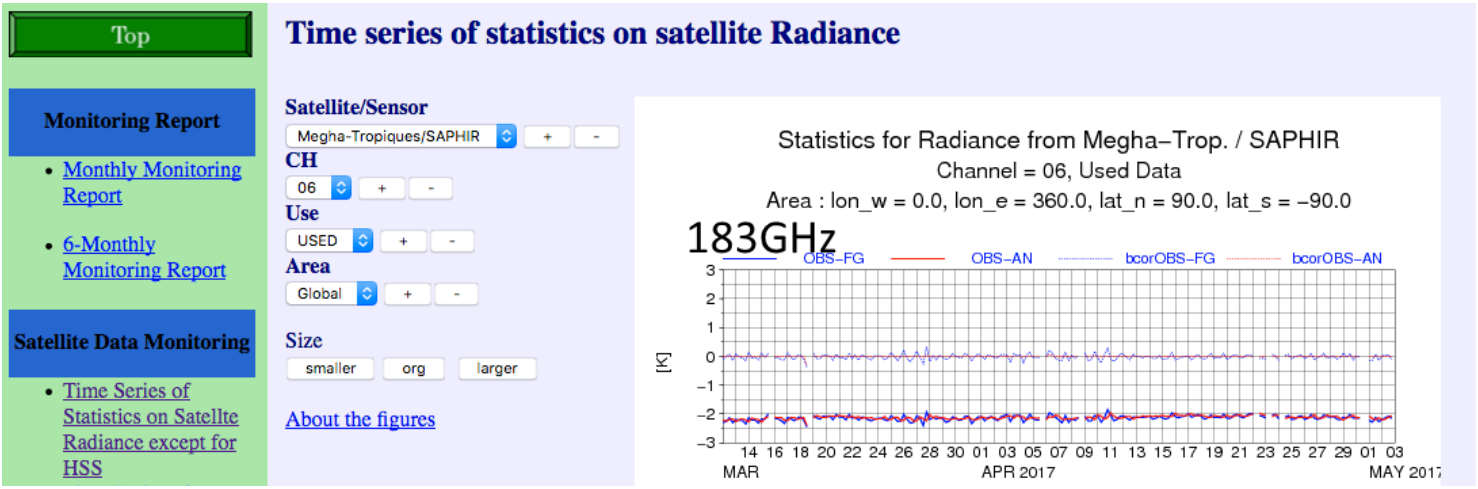
Efforts to assimilate SAPHIR brightness temperatures in global and regional models have shown positive impacts on model forecasts (Chambon et al. 2015, Singh et al. 2013). These encouraging results have compelled the National Oceanic and Atmospheric Administration's Center for Satellite Applications and Research (NOAA STAR), in support of the JC-

Real time stream of SAPHIR at NWP

NRT Stream via EUMETCast since Summer 2014

気象庁
Japan Meteorological Agency

- Monitoring of the data on line
  http://qc.kishou.go.jp/



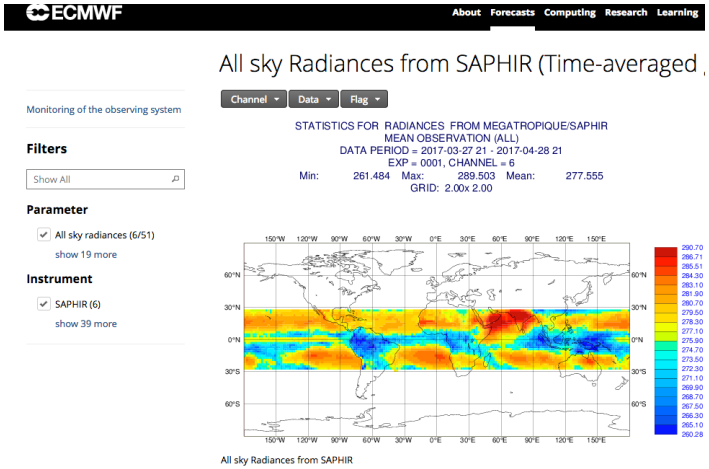
Research work in progress

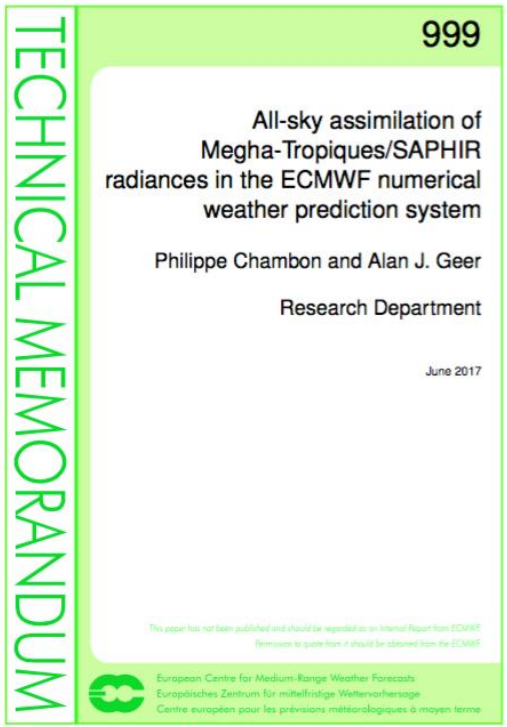
All-sky assimilation of sounders is on going. MHS & GMI ALL SKY test has shown positive impact extension to SAPHIR and MWHS2 on board the chinese satellite FY3C

Real time stream of SAPHIR at NWP

NRT Stream via EUMETCast since Summer 2014

- SAPHIR is monitored in RT and ALL Sky at the center
- http://www.ecmwf.int/en/forecasts/charts/obstat/
- Assimilation in operation : next upgrade of the sytsem (this year)





<u>On going:</u>

Publication of ECMWF Technical Memorandum on the results of the collaboration between Météo-France and ECWMF

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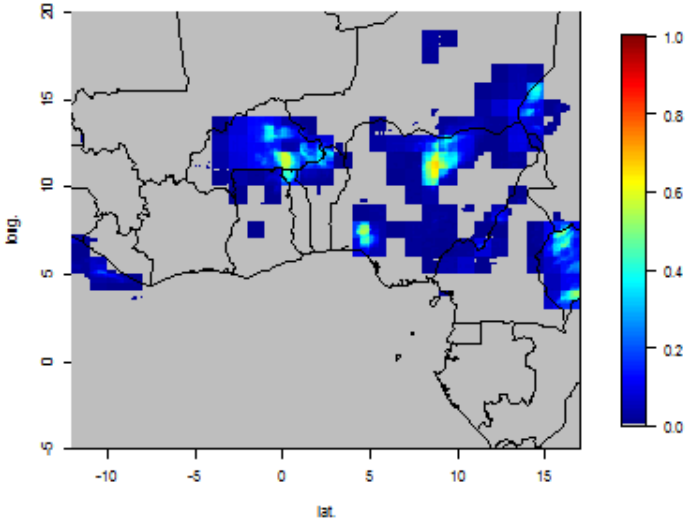
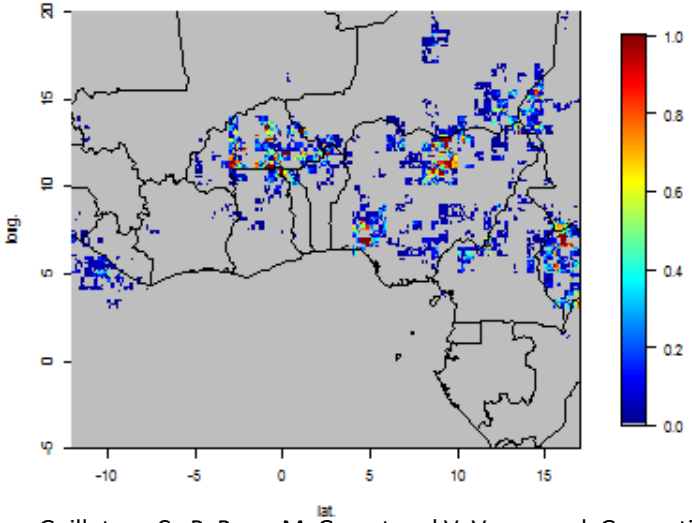
Hydrology & Surface

Downscaling TAPEER rainfall amount

Cooperation with Dr Venugopal IISc Bangalore



Guilloteau et al., 2017



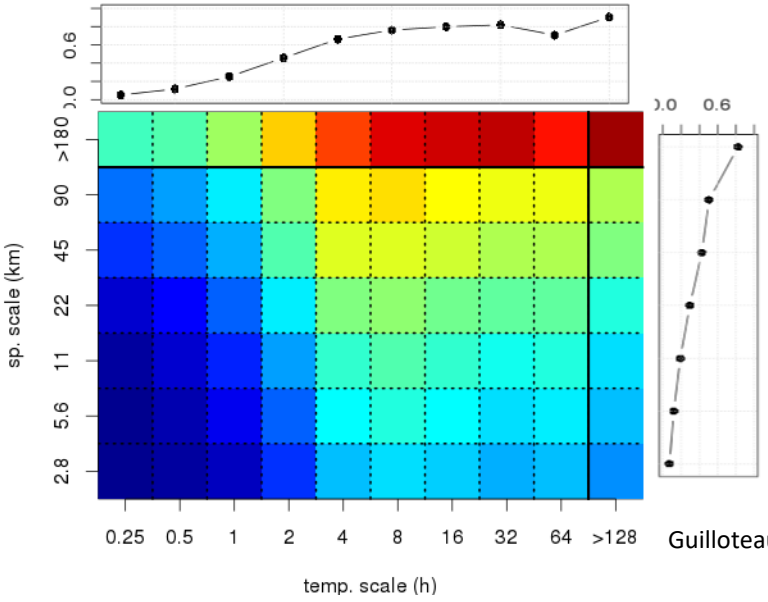
PhD work of C. Guilloteau (Nov 2016)

3 months visit at IIsc, Bangalore

Now with UC Irvine, USA

Using a newly developped wavelet technique

CORRELATION RADAR and TAPEER



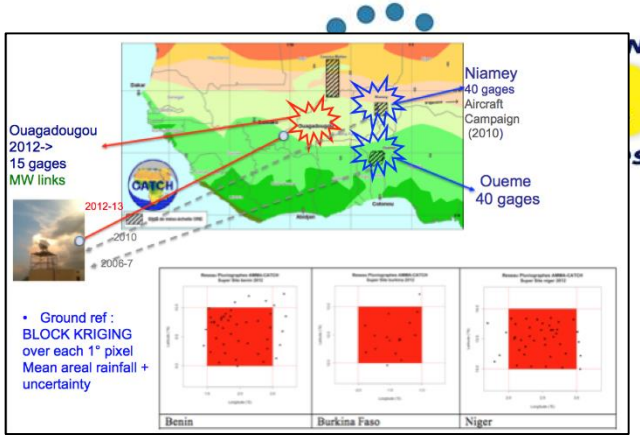
Guilloteau et al., 2016

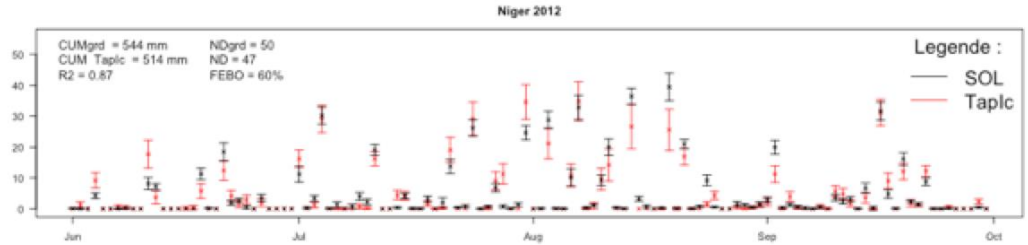
Guilloteau C., R. Roca, M. Gosset and V. Venugopal, Generation of High Resolution Precipitating Fraction Ensembles Fields With a Multiscale Observational Constraint From Satellite-borne Sensors, in preparation for the Special Collection "Advances in Remote Sensing of Rainfall and Snowfall", Q. J. R. Meteorol. Soc., **2017**

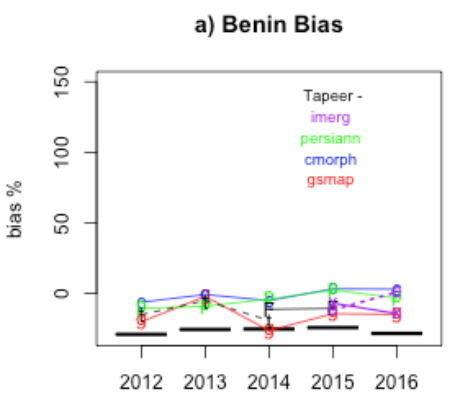
Guilloteau C, Rémy Roca, and Marielle Gosset, **2016**: A Multiscale Evaluation of the Detection Capabilities of High-Resolution Satellite Precipitation Products in West Africa. J. Hydrometeor., 17, 2041–2059, doi: 10.1175/JHM-D-15-0148.1.

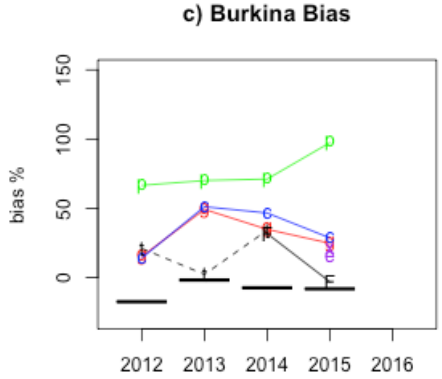
MT Hydro Applications and Validation

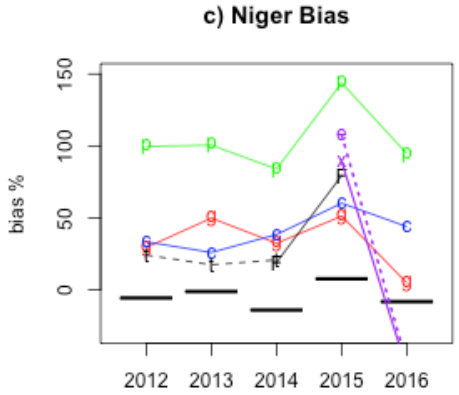
Direct Validation over (the only existing) high density gauges network in Africa

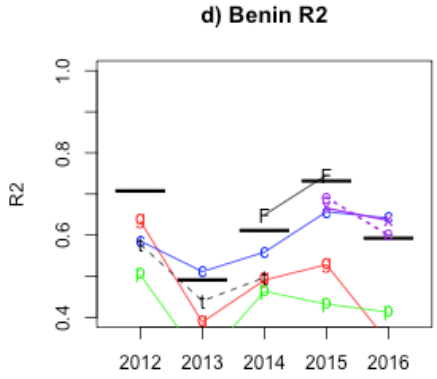


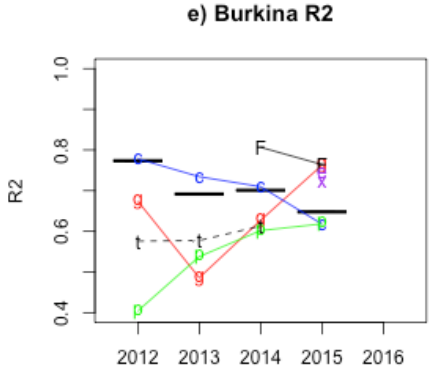


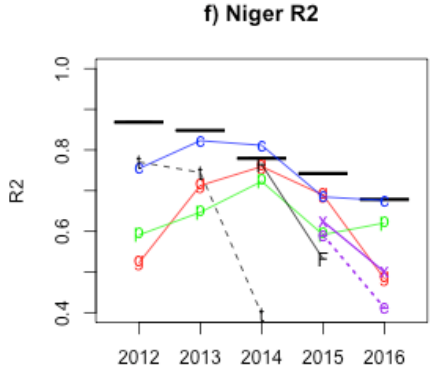










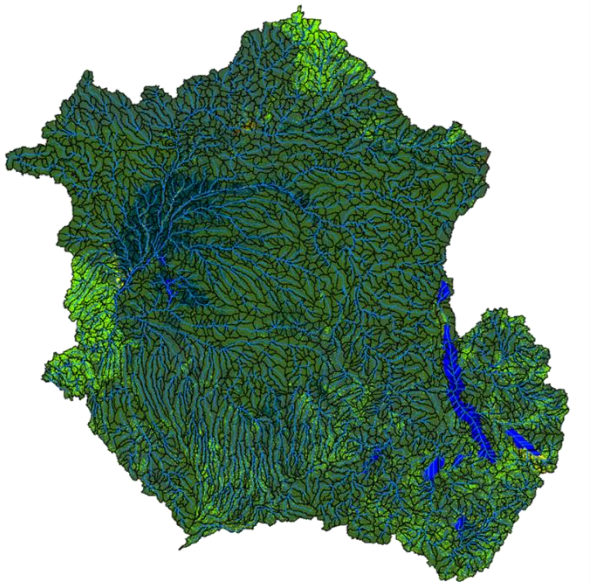


Gosset et al., 2017 QJRMS IPWG SI.

MT Hydro Applications and Validation

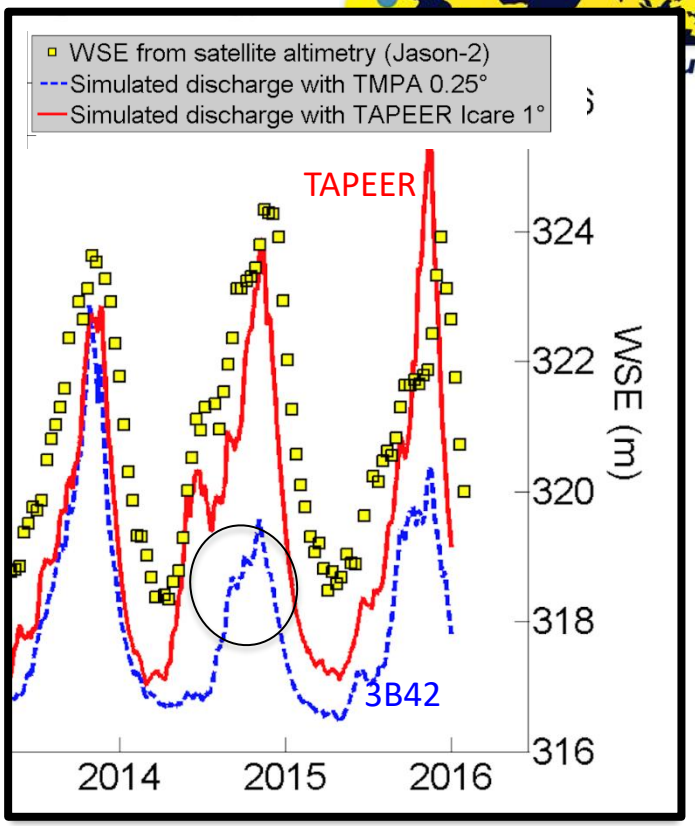
Indirect / Hydrological Validation

Congo Basin



Ubangui basin as a giant rain gauge

Comparison of rain forced simulated discharge with satellite altimetry



Ubangui River (Main Congo right margin tributary)

Comparisons of simulated / Observed discharge (or water height)

ALTIMETRY --

Simulation with TAPEERR 1.5

Simulation with TMPA 3B42 v7

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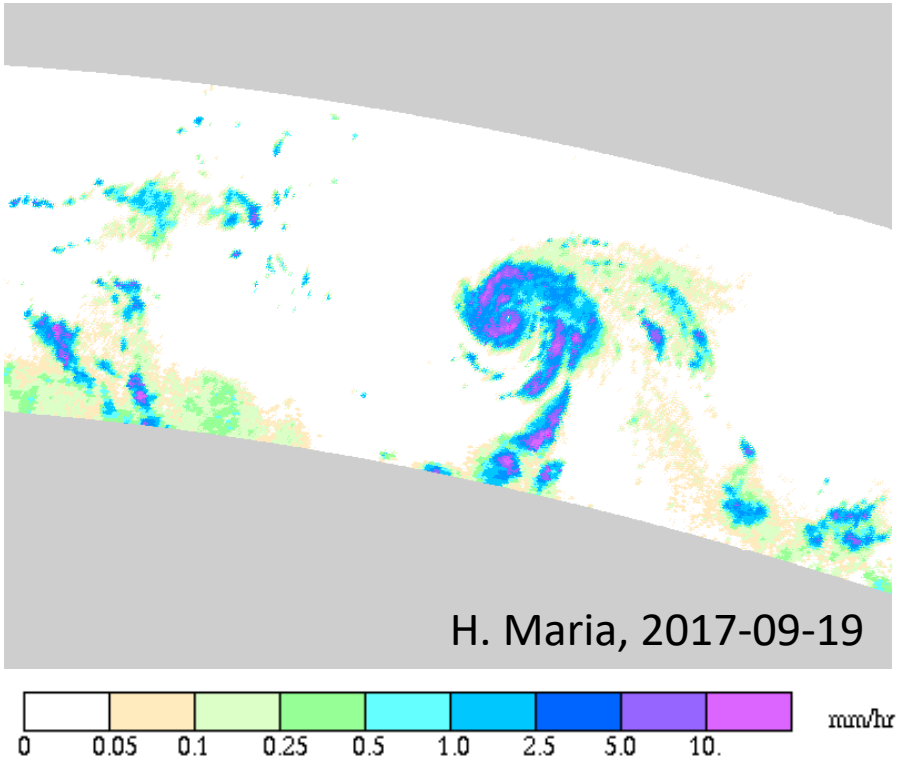
On going developments

TAPEER 2.0 - GPROF

TAPEER2.0 is led by M. Gosset and R. Junca

- 0.5°x0.5° / 6 hourly
- Sampling uncertainty
- Enhanced L2 to L4 uncertainty information

- Add GMI to our estimates
- Add the sounders
- In particular SAPHIR rainraintes



- Enhanced validation program (Africa and Brazil)

From Chris Kidd

Summary of the activity

6 years and still young as day 1

- **The SAPHIR instrument is brand new like**
- **1°X1°-1 data constellation product is at last released**
- **Assimilation in total sky is growing fast**
- **New joint NASA-France developments of TAPEER Hydro started and looking very encouraging.**

and remember, use this reference !

Roca et al, **2015** The Megha-Tropiques mission: a review after three years in orbit, Front. Earth Sci., 3, 1–14, doi:10.3389/feart.2015.00017, 2015.